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FROM EXPERIENCE OF STUDYING THE POLLUTION OF ATMOSPHERIC AIR WI--ETC(U)
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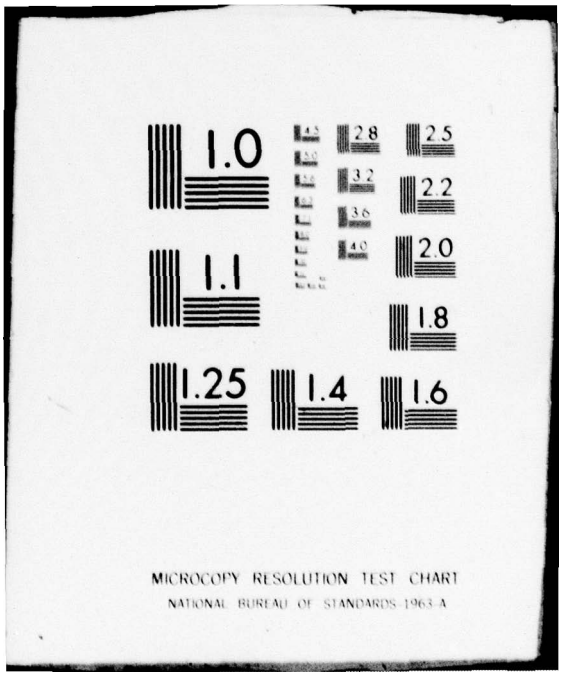
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FROM EXPERIENCE OF STUDYING THE POLLUTION OF ATMOSPHERIC AIR WITH 3,4-BENZOPYRENE IN REGIONS OF THE LOCATION OF INDUSTRIAL ENTERPRISES

By

Zh. L. Gabinova, A. A. Vasil'yeva, et al

EDITED TRANSLATION

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В в	*В в*	V, v	Т т	*Т т*	T, t
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Д д	*Д д*	D, d	Ф ф	*Ф ф*	F, f
Е е	*Е е*	Ye, ye; E, e*	Х х	*Х х*	Kh, kh
Ж ж	*Ж ж*	Zh, zh	Ц ц	*Ц ц*	Ts, ts
З з	*З з*	Z, z	Ч ч	*Ч ч*	Ch, ch
И и	*И и*	I, i	Ш ш	*Ш ш*	Sh, sh
Й й	*Й й*	Y, y	Щ щ	*Щ щ*	Shch, shch
К к	*К к*	K, k	Ъ ъ	*Ъ ъ*	"
Л л	*Л л*	L, l	Ы ы	*Ы ы*	Y, y
М м	*М м*	M, m	Ь ь	*Ь ь*	'
Н н	*Н н*	N, n	Э э	*Э э*	E, e
О о	*О о*	O, o	Ю ю	*Ю ю*	Yu, yu
П п	*П п*	P, p	Я я	*Я я*	Ya, ya

*ye initially, after vowels, and after ъ, ь; e elsewhere.
When written as ё in Russian, transliterate as yё or ё.

RUSSIAN AND ENGLISH TRIGONOMETRIC FUNCTIONS

Russian	English	Russian	English	Russian	English
sin	sin	sh	sinh	arc sh	$\sinh^{-1}$
cos	cos	ch	cosh	arc ch	$\cosh^{-1}$
tg	tan	th	tanh	arc th	$\tanh^{-1}$
ctg	cot	cth	coth	arc cth	$\coth^{-1}$
sec	sec	sch	sech	arc sch	sech^{-1}
cosec	csc	csch	csch	arc csch	csch^{-1}

Russian	English
rot	curl
lg	log

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FROM EXPERIENCE OF STUDYING THE POLLUTION OF ATMOSPHERIC AIR WITH 3,4-BENZOPYRENE IN REGIONS OF THE LOCATION OF INDUSTRIAL ENTERPRISES.

Sanitary doctors Zh. L. Gabinova, A. A. Vasil'yeva, N. Kh. Sklyarskaya, Candidate of the biological sciences M. D. Manita.

From the urban sanitary-epidemiological station of Moscow.

During the last few years in the different countries with the aid of fluorescent-spectrum methods of analysis, they began to study the pollution of atmospheric air by carcinogenic hydrocarbons. The most studied carcinogenic substance is at present 3,4-benzopyrene.

The first investigations of the pollution of atmospheric air with 3,4-benzopyrene were initiated in the Soviet Union in 1948 (B. P. Gurinov et al.). The detailed study of the pollution of atmospheric air with 3,4-benzopyrene was carried out in Leningrad by the winter of 1954-1955 (P. P. Dikun, L. M. Shabad, V. L. Norkin). However, Leningrad authors' data are only prospecting, since to

investigation were subjected the sample/tests of dust, obtained by sedimentation way.

In Moscow in the unitary sample/tests, selected by aspiration way by B. P. Gurinov in 1957 and investigated by fluorescent-spectrum method, it is discovered from 0.018 to 0.08 γ 3,4-benzopyrene to 100 m^3 of air.

The purpose of this work they are obtaining more full/total/complete and contemporary data on the state of the pollution of atmospheric air of Moscow with 3,4-benzopyrene and the possibility of developing the corresponding sanitation measures. Work was organized with participation and under the management/manual of the corresponding member of AMN USSR Prof. L. M. Shabad. For first order study were outlined industrial enterprises as the objects, least studied in this respect and on which at present most accessibly taking sanitation measures. The determination of 3,4-benzopyrene was conducted consecutively in source material, intermediate and end products, depositing from atmospheric air dust and in aspiration sample/tests in the environment of industrial enterprises with a fluorescent-spectrum method, developed by P. P. Dikun. Research were conducted in the physicochemical laboratory of the sanitary-epidemiological station of Moscow.

The source material of all planned objects (plants of "Kauchuk", rubber articles, busbar, roofing paper, rubber engineering articles, "Tol'prom", "Neftegaz", electrode, rubberoid, "Krasnyy bogatyr'", "Izolit") in this or another a quantity contains sludges, and consequently, is not excluded the possibility of the presence in it of 3,4-benzopyrene.

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Are investigated pitch, petroleum bitumen, soot (bulb, thermal, gas, injection, furnace, acetylene), petroleum coke, thermo-anthracite, cooking mass, anthracene oil, tarry mastic. In all are investigated 31 sample/tests of different products.

In the sample/tests of coal-tar pitch, selected at different plants, is discovered 3,4-benzopyrene in a quantity from 0.1 to 1.2o/o. In the investigated sample/tests of petroleum bitumen (brand 2, 3, 4, 5) of 3,4-benzopyrene, it is not fo[illegible] Of 10 specimen/samples of soot 6 forms of 3,4-benzopyrene, it was discovered in bulb and gas black from plant "Krasnyy bogatyr" 1 respectively in quantities 0.005 and 0.0003o/o, in furnace soot from plant "Kauchak" - in quantity 0.0004o/o. In the remaining specimen/samples of 3,4-benzopyrene, it was not found. It was discovered also in petroleum coke, thermo-anthracite and cooking mass of electrode

plant, in pitch, anthracene oil and tarry mastic of ruberoid plant.

Attention is drawn to the fact that petroleum coke of different brands, which are used at one and the same plant (electrode), contain different quantities of 3,4-benzopyrene (from 0.00007o/o in pyrolytic coke to 0.007o/o in the coke of plant "Neftegaz"). This fact, apparently influences different content of 3,4-benzopyrene in cooking mass of one and the same plant (0.005, 0.01o/o). The same is related also to the different brands of soot, used in one and the same enterprise. This gives the possibility to propose in productions the application/use of a raw material, which does not contain 3,4-benzopyrene.

Study of raw material used and technology of inspected enterprises gave the basis to assume the presence of 3,4-benzopyrene in throw-outs in the atmosphere, in particular in the depositing dust.

For obtaining tentative data on the pollution of atmospheric air 3,4-benzopyrene in different city blocks of city was conducted research of sedimentation dust in the environment of some of the industrial enterprises (plants electrodes, "Tol'prom", "Krasnyy bogatyr'", rubberoid plant) indicated, and also around other objects (motor depot, factory "Goznak"). The sampling of the depositing dust

produced during April - May of 1960 with the method of estimates from interframe openings of windows within winter period, moreover were selected windows with glused slits of frames from the side of the rooms (it is selected 30 sample/tests).

From the obtained results of sample test of source material, it was possible to expect that great air pollution with 3,4-benzopyrene must be in the environment of the industrial enterprises, using as source material coal-tar pitch, petroleum coke and so forth.

Further investigation of the depositing dust around enterprises indicated above in essence confirmed this assumption. So, the maximum concentration of 3,4-benzopyrene is found in the depositing dust in the environment of plant "Tol'prom" depending on distance from 0.009 to 0.049o/o (source material coal-tar pitch and resin) and electrode plant - from 0.0013 to 0.01o/o (source material pitch, petroleum coke, etc.). The high content of 3,4-benzopyrene in the depositing dust from atmospheric air in the environment of these enterprises can be explained by the application/use as source material of coal-tar pitch and coal tar at plant "Tol'prom" and pitch and petroleum coke at electrode plant. The indicated raw material contains the large percentage of 3,4-benzopyrene.

In the sample/tests of the depositing dust, selected in the

building of sanitary-epidemnological station of Moscow from the interframe openings of windows with different orientation, is discovered considerably less than 3,4-benzopyrene - from full/total/complete absence to hundred-thousand and ten thousandth portion/fractions percentage. In this region there are no specific industrial enterprises in throw-outs of which it would be possible to assume the presence of carcinogenic substances.

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Analogous data (order of the ten thousandth portion/fractions of the percentage of 3,4-benzopyrene in the depositing dust) were obtained in the environment of factory "Goznak", motor depots also of motor vehicle repair plant.

Thus, the content of 3,4-benzopyrene in the depositing dust of inspected regions varies in the sufficiently broad band: from hundred-thousand ones to one hundredths of a percent, which can be explained by the presence of the corresponding sources of pollution. The first results of our investigations it already made possible to propose conducting a series/number of sanitation measures in some productions. So, on the basis of the resolutions of the head physician of sanitary-epidemological station of Moscow they are ended the exploitation of plant "Tol'prom" and the production of tarry

mastic at Moscow rubberoid plant.

The second stage of work was the investigation of the aspiration sample/tests of atmospheric air, which are of greatest interest during the hygienic estimation of air medium.

According to data of Weller (1949-1951), in the industrial cities of England the annual concentrations of 3,4-benzopyrene oscillate from 1.3 to 4.6 γ to 100 m^3 of air.

For the detection of such small concentrations of 3,4-benzopyrene by fluorescent-spectrum method it is necessary for one analysis to select the enormous volume of air (thousand of cubic meters); in this case, must be secured sufficient collecting from air of finely dispersed dust into which enters 3,4-benzopyrene (temperature of its melting of 179°).

The usual filtering materials, which are used during aspiration sampling from atmospheric air (cotton wool, filter paper), do not satisfy requirements indicated above, since during the utilization of cotton wool is high percentage of the overshoct of finely dispersed dust, but filter paper, although it catches finely dispersed dust, gives very high resistance, which impedes the selection of this large air volume.

For the aspiration selection of atmospheric pollution most of all, satisfies the indicated requirements Petryanov's synthetic cloth, since it during low resistance provides the significant collecting of finely dispersed dust.

During more detailed familiarization with the properties of different brands of Petryanov's cloth (FPP, FPA, etc.) of all cloths for the aspiration sampling of air to 3,4-benzopyrene of more of adequate/approaching render/showed the cloth of brand FPA-15 on acetylcellulose base, since it is not dissolved in benzene with extraction. Other brands of Petryanov's cloth, including most widely used FPP-15, are dissolved in benzene, which prevents the determination of 3,4-benzopyrene by a fluorescent-spectrum method. Experiments, carried out with the cloth FPA-15, yielded positive results.

At present for the selection of the aspiration sample/tests of dust, is proposed the installation, equipped at Moscow electrode plant. As raw material for this production serve thermo-anthracite, petroleum coke, soot, coal-tar pitch, graphite. Technological process consists in the crushing of thermo-anthracite or petroleum coke. Crushed material is calcined in gas-fired calcincing furnaces at

1300°. Generating here dust is caught by bag-type filters. After cooling to 80°, tempered petroleum coke undergoes repeated grinding before the achievement of the stage of superfines. Dust is caught by bag-type filters. Then granular carbon mixes with graphite and other materials it is obtained charge. The exhausted air undergoes two-stage purification/cleaning - in cyclone and bag-type filter or in electrofilter. Charge and liquid pitch, which has temperature of 120°, enter the mixing machines where the mixing is produced during preheating of mass to 120°. The air, which contains carbon-graphitic dust, enters the two-stage purification into adsorptive column and cyclone. From mixing machines doughy mass is supplied to pressing into hydraulic press.

The cooled electrodes undergo firing in gas-fired calcining furnaces at 200-1300° under the layer of the filling, which consists of small/fine foundry coke.

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The assembly for the preparation of filling is equipped by bag-type filters. The collecting of dust and particles of sublimated resin, which are generated in the furnaces of firing, is produced in 4 electrofilters.

Electrodes mechanically are treated. Generating in this case in large quantities dust undergoes two-stage purification/cleaning in the cyclones of Liot and in bag-type filters or wet scrubbers. The grasped dust anew goes into production.

Aspiration installation has an electric motor of brand AOL-21/4 in power/thickness 0.27 kW with number of revolutions 1500 per minute, fan TsBSD of series EVR No. 2 and gas counter of model RS-40 (Fig. 1 and 2).

As the filtering cloth is used Petryanov's cloth FPA-15, fasten/strengthened to special air-inlet funnel. Area of filter 314 cm^2. Air is sucked in quantity by 10-20 m^3/h, i.e. at a rate of 0.5-1 l/min to 1 cm^2. According to data of I. I. Gusarov and V. K. Lyapidevskiy (1958), cloth of brand FPA-15 at the speed of the suction of air 12.1-12.8 l/min to 1 cm^2 gives the overshoot of dust approximately 8.4o/o. Consequently, at speed 0.5-1 l/min to 1 cm^2, with which we produce air bleed, it is necessary to set/assume, the overshoot of dust will be considerably less. This sampling method completely removes the possibility of the loss of the finely dispersed fractions of dust during conducting of analysis.

The advantage of this installation are the continuity of work during long time and the account of a quantity of aspirated air at

plus temperatures with sufficient authenticity (on gas counter).

Each sample/test they take/selected on the average during 5 days, passed 2000-3000 m^3 of air. A quantity of dust in each sample/test oscillated from 0.2 to 1 g. Research were conducted from August through November 1961. In all is selected 13 sample/tests.

As a result of the conducted investigations, are discovered the concentrations of 3,4-benzopyrene from 0.4 to 2.33 γ to 100 m^3 of air (see the Table).

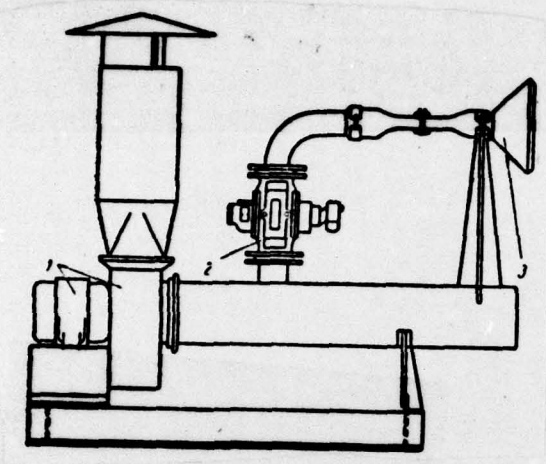

Fig. 1.

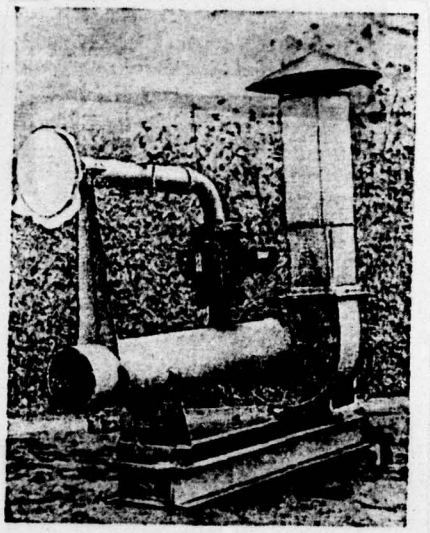

Fig. 2.

Fig. 1. Installation diagram for sampling of air for pollution 3,4-benzopyrene. 1 - fan with electric motor; 2 - gas counter RS-40; 3 - air-driven funnel.

Fig. 2. General view of installation for sampling of air.

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As can be seen from table, of 13 investigated sample/tests only into 4 quantities of 3,4-benzopyrene did not exceed 1 γ to 100 m³ of air. The majority of sample/tests contains from 1 to 2 γ 3,4-benzopyrene to 100 m³ of air. Attention is drawn to the fact that with an increase in the percentage of resin in the dust, obtained

from atmospheric air, respectively is increased a quantity of 3,4-benzopyrene in the majority of sample/tests. The obtained by us concentrations of 3,4-benzopyrene in atmospheric air (0.4-2.33 γ to 100 m^3) considerably exceed the concentrations, obtained by B. P. Gurinov on Moscow in 1957 (0.018-0.08 γ to 100 m^3), which, apparently can be explained by the more advanced method of aspiration sampling.

The results of the aspiration sampling of atmospheric air.

(1) № пробы	(2) Время отбора пробы	(3) Количество 3,4-бензпирена (в γ на 100 м³ воздуха)	(4) Количество смолы в пыли из атмосферного воздуха (в %)
1	21/VII—2/VIII	1,10	—
2	2/VIII—10/VIII	0,94	3,20
3	10/VIII—19/VIII	0,54	1,80
4	19/VIII—24/VIII	1,59	4,30
5	24/VIII—29/VIII	0,40	1,00
6	29/VIII—4/IX	2,10	5,20
7	4/IX—15/IX	1,10	—
8	21/IX—26/IX	1,60	—
9	26/IX—2/X	1,90	9,50
10	2/X—7/X	1,90	7,54
11	7/X—12/X	0,52	—
12	18/X—24/X	0,10	8,46
13	24/X—31/X	2,33	9,30

Note. Duration of sampling from 120 to 215 hours. A quantity of passed through absorbers air oscillated from 735 to 2987 m³.

Key: (1). sample/test. (2). Time of sampling. (3). Quantity of 3,4-benzopyrene (in γ to 100 m³ of air). (4). Quantity of resin in dust from atmospheric air (in o/o).

Conclusion/derivations.

1. Is establish/installed presence of 3,4-benzopyrene in some forms of raw material, intermediate and end products of number of inspected industrial enterprises; in environment of these enterprises, is discovered 3,4-benzopyrene in depositing from atmospheric air dust.

2. In aspiration sample/tests of atmospheric air, selected on industrial pad of electrode plant from August through November 1961, are discovered concentrations of 3,4-benzopyrene 0.4-2.33 γ to 100 m^3 of air.

3. Obtained objective laboratory data and results of health and hygiene examination/inspections served as basis/base for conducting a series/number of sanitation measures.

The present report/communication reflects the first stages of the made work. Subsequently is planned the expansion and the depression of investigations.

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